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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 09/737,397 | 12/15/2000 | Yasuaki Tsuchiya | 14162 | 8837 |

7590 03/26/2002

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[REDACTED] EXAMINER

GUERRERO, MARIA F

| ART UNIT | PAPER NUMBER |
|----------|--------------|
| 2822 | |

DATE MAILED: 03/26/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | |
|------------------------------|----------------------------|------------------|
| Office Action Summary | Application No. | Applicant(s) |
| | 09/737,397 | TSUCHIYA ET AL. |
| | Examiner Maria Guerrero | Art Unit 2822 |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 12-15-00.
 2a) This action is FINAL. 2b) This action is non-final.
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1-32 is/are pending in the application.
 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
 5) Claim(s) _____ is/are allowed.
 6) Claim(s) 1-32 is/are rejected.
 7) Claim(s) _____ is/are objected to.
 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
 10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 11) The proposed drawing correction filed on _____ is: a) approved b) disapproved by the Examiner.
 If approved, corrected drawings are required in reply to this Office action.
 12) The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) All b) Some * c) None of:
 1.) Certified copies of the priority documents have been received.
 2.) Certified copies of the priority documents have been received in Application No. _____.
 3.) Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

- 14) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
 a) The translation of the foreign language provisional application has been received.
 15) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>3</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This Office Action is the First Action on the merits.

Claims 1-32 are pending.

Claim Objections

2. Claim 2 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 2 recites the limitation "wherein polishing is conducted such that the interconnect metal film remains in 5% to 30% both inclusive of the surface of the surface area other than the concave". Independent claim 1 recites, "polishing until the surface of the insulating film other than the concave is substantially completely exposed".

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1, 8, 10-11, 28, 31 are rejected under 35 U.S.C. 102(b) as being anticipated by Yasutaka et al. (JP-08083780) (Translation).

Yasutaka et al. teaches forming a concave in an insulating film formed on a substrate, forming a barrier layer, forming an interconnect metal film (copper or copper alloy) over the whole surface, polishing the surface by a first and second polishing

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processes until the surface of the insulating film other than the concave is exposed (Fig. 4,8, claims, Detailed description pages 1-8, Example pages 1-5). Yasutaka et al. discloses using a polishing slurry comprising silica polishing material and an inorganic salt, using an oxidizing agent (benzotriazole)(Detailed description pages 2-4, Means page1-2). The polishing-rate ratio of the interconnect metal to the barrier metal film is a characteristic inherent in the material.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 2-9, 13-26, and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yasutaka et al. (JP-08083780) (Translation) in view of Kyle (WO00/52230).

Regarding claims 2-9, 13-26, and 29, Yasutaka et al. fails to show the polishing slurry comprising an alkanolamine and a carboxylic acid. However, Keil, deceased et al. shows the use of alkanolamines (such as, ethanolamine, diethanolamine, triethanolamine) and carboxylic acid (maleic acid) in a polishing process as well known in the art (Abstract, col. 1, lines 5-14, 38-41, col. 3, lines 10-25,55-65, col. 4, lines 10-40).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to include the use of alkanolamines and carboxylic acid in

Yasutaka et al.'s process as taught Keil. The modification would avoid corrosion of the metal film (Keil, col. 1, lines 55-60).

5. Claim 12, 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yasutaka et al. (JP-08083780) (Translation) in view of Applicant admitted prior art.

Regarding claims 12, 32, Yasutaka et al. fails to show the use of tantalum containing metal as the barrier film. However, Applicant admitted prior art discloses the use of tantalum as conventional in the art (page 3).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Yasutaka et al.'s process by including tantalum in the barrier film because it is widely used in semiconductor process.

6. Claims 22, 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yasutaka et al. (JP-08083780) (Translation) and Kyle (WO00/52230 as applied to claims 13, 23 above, and further in view of Applicant admitted prior art.

Regarding claims 22, 27, Yasutaka et al. fails to show the use of tantalum containing metal as the barrier film. However, Applicant admitted prior art discloses the use of tantalum as conventional in the art (page 3).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Yasutaka et al. and Keil by including tantalum in the barrier film because it is widely used in semiconductor process.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Huff (U.S. 4,892,612) teaches a polishing method using alkanolamine. Chandler et al. (U.S. 5,854,145) and Kyle (WO00/52230) teach the use of carboxylic acid and alkonalamines as corrosion inhibitor. Hayashi et al. teaches a two-step metal CMP technique. Usami et al. (U.S. 6,140,225), Tsuchiya (U.S. 5,959,359) show a process for forming a metal interconnection structure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Maria Guerrero whose telephone number is 703-305-0162.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead Jr. can be reached on 703-308-4940. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7382 for After Final communications.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

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March 19, 2002

Carl Whitehead Jr.
CARL WHITEHEAD, JR.
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800